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# Morningside Evaluations and Consulting

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I, Nancy Sullivan, a translator fluent in the Japanese language, on behalf of Morningside Evaluations and Consulting, do solemnly and sincerely declare that the following is, to the best of my knowledge and belief, a true and correct translation of the document(s) listed below in a form that best reflects the intention and meaning of the original text.

## MORNINGSIDE EVALUATIONS AND CONSULTING

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Date: June 21, 2004

Description of Documents Translated: Japanese patent

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(19) Japan patent Office (JP)  
 (12) Public Patent Disclosure Bulletin (A)  
 (11) Public Patent Disclosure Application: S59 -164399  
 (43) Date of Public Patent Disclosure Application: September 17, 1984

(51) Int. Cl. <sup>3</sup>	Identification Code	Internal File Nos.	Number of Inventions: 1
C 11 D 7/60		6660 - 4H	Request for Examination: Not requested
17/60		6660 - 4H	(7 pages total)

(54) Foam-generating Detergent Composition for Cleaning Hard Surfaces			
(21) Application No.: S58-39522		(72) Inventor: Koichi Yamada	
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### SPECIFICATION

1. Title of Invention  
Foam-generating Detergent Composition for Cleaning Hard Surfaces
2. Claims
  1. A double component type foam-generating detergent composition characterized by an oxygen-derivative oxidizing agent composition containing inorganic peroxide and 0.25 - 25% available oxygen by weight, as the aqueous solution agent A, and a chlorine-derivative oxidizing agent composition containing hypochlorite and 0.25 - 60% available chlorine by weight, as the aqueous solution agent B, that same agent B also containing 0.1 - 50% silicate by weight.
  2. The foam-generating detergent composition for cleaning hard surfaces indicated in Claim 1 wherein a surfactant is present in at least one of the aforementioned agents A or B.
3. Detailed Explanation of Invention  
 Along with effectively removing dirt from plastics, ceramics, tile, joints, inside of drainpipes, etc. this invention of a double component type foam-generating detergent composition provides an odor-extinguishing and odor-preventive effect.  
 Conventionally, acids and alkalis are known as the principle ingredients in liquid cleaning agents used as home use cleaning agents on plastics, ceramics, and tiles, and powders and liquid cleaning agents that contain abrasives are known cleaning agents for use on joints. However, the detergency of these cleaning agents has yet to be sufficient.

In recent years, together with westernization of ordinary homes and multi-story

apartment buildings and a change to western style eating habits, contamination such as discarded food scraps, excrement, hair, scum, and bathroom dirt has clogged the inside of drainpipes, traps and extension pipes of kitchens, bathrooms, toilets, etc. adhering to the interior wall surface of the pipes, wherein, many instances of hindered water flow in the pipe have been observed. This kind of interior contamination of a drainpipe, having hard to reach hair in the area of removal, is one of the most difficult among hard surfaces in the home to remove.

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Being reported as conventional methods to remove contaminants of drainpipes, traps, extension pipes, etc. are a method to dissolve and emulsify using a chlorinate hydrocarbon as the active agent (U.S. Patent No. 3,563,145 Specifications), a method to decompose the contaminant by means of oxygen and microscopic organisms (Public Patent Disclosure Bulletin No. S38 (1963) – 26465), a method using hypercarbic soda as the active agent (Patent Publication No. 52 (1978) – 152406), a method using an acid agent and an alkaline carbonate (Public Patent Disclosure Bulletin No. 53 (1979) – 50207), a method of using an oxidizing agent such as an acid agent, an alkaline carbonate, and a hypercarbic soda (Public Patent Disclosure Bulletin No. 53 (1979) – 50208), etc., but the detergency among these is not yet satisfactory.

In the specifications of U.S. Patent Specification No. 3,471,407, a method to release a strong alkali such as caustic soda, aluminum, and inorganic nitrate is being reported, but this is extremely hazardous. Still, in the specifications of U.S. Patent Specification No. 3,538,008, a method to release strong acids such as  $H_2SO_4$ ,  $HCL$ ,  $HNO_3$ , orthophosphate, and sulfamate with silica gel is being disclosed, but this is extremely hazardous as well and is highly corrosive.

On the other hand, utilizing aerosol propulsive pressure to introduce a lead through a drain pipe that is completely clogged is a method that is well known but this has almost no effect on contaminants that have accumulated on walls. Physical removal of the contaminant inside the drain pipe has been considered but the time it takes to conducting it easily is troublesome.

This invention was created in order to resolve the problematic points like those in the conventional technology previously indicated, easily and effectively removing contaminants on the hard surfaces of plastics, ceramics, tile, joints, interior areas of drain pipes, etc., with the objective of providing a double component type foam-generating detergent composition capable of furnishing an odor-extinguishing and odor-preventive effect. In addition, the invention is stable when it is stored and when it is in use and its objective is to be submitted as a cleaning agent composition that can be safely used.

That is to say that, the invention of a double component type foam-generating detergent composition has agents A and B below and is characterized by containing 0.1 – 50% silicate by weight within agent B.

- (1) Agent A: an oxygen-derivative oxidizing agent composition containing inorganic peroxide and 0.25 – 25% available oxygen by weight, this composition is an aqueous solution.

(2) Agent B: a chlorine-derivative oxidizing agent composition containing hypochlorite and 0.25 -60% available chlorine by weight, this composition is an aqueous solution.

Agent A and Agent B are mixed without coming into contact with each other at the time of use with water being added according to need.

Further details of the invention are explained below.

Agent A is an oxygen-derivative oxidizing agent composition containing inorganic peroxide and is an aqueous solution; the volume of inorganic peroxide in agent A is 0.5 - 50 % by weight in the case of a liquid and 10 - 100% by weight as a solid is preferred, also preferred are a 1 - 35 wt % individually, and a 30 - 90 wt %. Sufficient detergency is not obtained when available oxygen volume does not reach 0.25%, but storage stability deteriorates when it exceeds 25% at which time its home use is not desirable due to the increased risk of danger.

Here, the volume of available oxygen is the ratio of volume of available oxygen (O) in the bleach, etc. contained in agent A compared to the total of agent A. This measurement usually is facilitated by using potassium permanganate, etc.

As inorganic peroxide in agent A, its use is possible when it has decomposed in the reaction with the hypochlorite but hydrogen peroxide and hypercarbic saline are preferred represented as  $(\text{Na}_2\text{CO}_3 \cdot n \text{H}_2\text{O}_2)$  typically  $n = 3/2$  with the hydrogen peroxide adduct. Other substantial examples are sodium perboric acid, hydrogen peroxide adduct of sodium sulfuric acid, hydrogen peroxide adduct of sodium silicate, and the hydrogen peroxide adduct of sodium orthophosphate. Preferred among those indicated above are hydrogen peroxide and hypercarbic saline.

Agent B is a chlorine-derivative oxidizing agent composition containing hypochlorite and is an aqueous solution; the volume of hypochlorite in agent B is 0.25 - 40 % by weight in the case of a liquid and 1 - 100 % by weight as a powder is preferred, also preferred are a 1 - 15 wt % individually and a 10 - 90 wt %. In addition, available chlorine in agent B is 0.25 - 60% but 1 - 15% is preferred. Sufficient detergency is not obtained when available chlorine does not reach 0.25%, but storage stability deteriorates when it exceeds 25% at which time its home use is not desirable due to the increased risk of danger.

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Here, the volume of available chlorine is the ratio of volume of available chlorine ( $\text{Cl}_2$ ) in the bleach, etc. contained in agent B compared to the total of agent B.

Sodium hypochlorite, potassium hypochlorite, and high-test bleaching powder can be examples of the hypochlorite in agent B, with sodium hypochlorite and potassium hypochlorite being preferred.

Silicate included in agent B is 0.1 - 50 wt % with a 0.5 - 50 wt % preferred.

Sufficient odor-extinguishing and odor-preventive effect is not obtained at the 0.1 wt %, and a 50 wt % produces a deleterious effect upon the stability of the available component in agent B. Furthermore, in the case of a liquid composition a content of 0.5 - 5 wt % for agent B is suitable and in the case of a solid composition a content of 0.5 - 50 wt % is suitable.

Because adding silicate to agent A produces a deleterious effect upon the stability of the inorganic peroxide the silicate is added to agent B.

As substantial examples of silicates, sodium orthosilicate,  $(2\text{Na}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , sodium sesquisilicate  $(3\text{Na}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , sodium metasilicate  $(\text{Na}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , sodium silicate 1  $(\text{Na}_2\text{O} \cdot 2\text{SiO}_2 \cdot \text{aq})$ , sodium silicate 2  $(2\text{Na}_2\text{O} \cdot 5\text{SiO}_2 \cdot \text{aq})$ , sodium silicate 3  $(\text{Na}_2\text{O} \cdot 3\text{SiO}_2 \cdot \text{aq})$ , sodium silicate 4  $(\text{Na}_2\text{O} \cdot 4\text{SiO}_2 \cdot \text{aq})$ , potassium orthosilicate  $(2\text{K}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , potassium sesquisilicate  $(3\text{K}_2\text{O} \cdot 2\text{SiO}_2 \cdot x\text{H}_2\text{O})$ , potassium metasilicate  $(\text{K}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , lithium orthosilicate  $(\text{Li}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , lithium sesquisilicate  $(3\text{Li}_2\text{O} \cdot 2\text{SiO}_2 \cdot x\text{H}_2\text{O})$ , lithium metasilicate  $(\text{Li}_2\text{O} \cdot \text{SiO}_2 \cdot x\text{H}_2\text{O})$ , etc. can be examples of sodium-, potassium-, and lithium- type alkaline metallic salts, and of these, sodium metasilicate, potassium metasilicate and lithium metasilicate are preferred.

The attributes of agent A and agent B are good both as a liquid (aqueous solution) and as a solid (usually in powdered form). Examples of those combinations of agent A and agent B that are particularly preferred are as follows.

(1) Liquid/Liquid Type

Agent A: Aqueous solution of 1.0 – 35 wt % of hydrogen peroxide

Agent B: Aqueous solution containing 1.0 – 15 wt % of sodium hypochlorite and 0.5 – 5 wt % of sodium metasilicate.

(2) Powder /Liquid Type

Agent A: Powder composition containing 10 – 100 wt % of hypercarbic saline

Agent B: Aqueous solution containing 0.5 – 15 wt % of sodium hypochlorite and 0.5 – 5 wt % of sodium metasilicate.

(3) Liquid/Powder Type

Agent A: 1.0 – 35 wt % of liquid hydrogen peroxide.

Agent B: Powder composition containing 2.0 – 95.5 wt % of bleaching powder and 0.5 – 50 wt % of sodium metasilicate.

(4) Powder/Powder Type

Agent A: Powder composition of 10 – 100 wt % of hypercarbic soda.

Agent B: Powder composition of 2.0 – 95.5 wt % of bleaching powder and 0.5 – 50 wt % of sodium metasilicate.

With the foam-generating detergent composition of this invention, again, the addition of a surfactant to either one of or to both agents A and B is possible. Principle among the details previously mentioned is that the surfactant contributes to the stability of the foaming. Therefore, capable of being used in either when producing this kind of effect, that which stores with stability as a component of agent A and a component of agent B is preferred. As a surfactant, it is possible to use either an anionic surfactant, a nonionic surfactant, a cationic surfactant, or an amphoteric surfactant but those that are especially preferred are the anionic and nonionic surfactants. Substantial examples of these kinds of surfactants are indicated below.

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## (1) Anion Surfactant

Fatty acid base with carbon numbers 10 ~ 20

Alkylsulfate with carbon numbers 10 ~ 18

Alkylbenzene sulfonate with carbon numbers 10 ~ 18

 $\alpha$ -olefin sulfonate with carbon numbers 8 ~ 18

Polyoxyethylene, alkylether sulfonate whose average molarity addition

(EOP) of ethylene oxide (EO) is 1 ~ 10 with a carbon number of 8 ~ 18

Polyoxyethylene, alkylphenylether sulfonate whose EOP = 6 ~ 20 with a carbon number of 6 ~ 12

## (2) Nonionic Surfactant

Alcohol EO adduct with carbon numbers 10 ~ 20 (EOP = 6 ~ 20)

Alkylphenol EO adduct with alkyl group carbon numbers of 6 ~ 12  
(EOP = 6 ~ 20)Sorbitan alkylether EO adduct with alkyl group carbon numbers of 12 ~ 18  
(EOP = 3 ~ 30)

Fatty Acid EO adduct with carbon numbers 12 ~ 18 (EOP = 5 ~ 50)

## (3) Cationic Surfactant

Buffer (4) ammonium salt

Imidazoline (4) buffer salt

## (4) Amphoteric Surfactant

Betaine

Amino salt

Imidazoline

Among the surfactants listed above that excel in particular in generating foam and are provided as examples are anionic surfactants such as alkylsulfate with an average carbon number of 12, alkylbenzene sulfonate whose alkyl group has an average carbon group of 12,  $\alpha$ -olefin sulfonate with carbon numbers 12 ~ 18, polyoxyethylene nonyl phenyl ether (EOP = 8 ~ 10), and anionic surfactants such as lauric alcohol EO adduct (EOP = 8 ~ 10), and nonyl phenyl ether EO adduct (EOP = 8 ~ 10). Again, for stability when stored, alkylsulfate with an average carbon number of 12, polyoxyethylene nonyl phenyl ether (EOP = 8 ~ 10), lauric alcohol EO adduct (EOP = 8 ~ 10), nonyl phenyl ether EO adduct (EOP = 8 ~ 10), etc. excelled. Furthermore, anionic surfactants that can be exemplified as those that excel in the effect of promoting permeation action on contaminants are alkylsulfate with an average carbon number of 12, alkylbenzene sulfonate whose alkyl group has an average carbon group of 12,  $\alpha$ -olefin sulfonate with carbon numbers 12 ~ 18, and polyoxyethylene nonyl phenyl ether (EOP = 8 ~ 10).

Surfactants that have been added in a way wherein they are included as 0.1 ~ 10 % by weight of agents A or B are desired but a 0.5 ~ 10 % by weight is preferred. Sufficient foaming power is not achieved when this value does not reach 0.1%, and stability is not obtained and, together when conditions of stability for storage purposes

deteriorate and 20% is exceeded, a decrease in available component induces an accompanying decrease in effective detergency.

The following is an explanation of how to use the detergent composition for cleaning hard surfaces without a cleaning mechanism.

Agents A and B are stored individually and, when used on contaminants on hard surfaces, it is best that they be used at the same time as their sequence of application or suitability of separate use is not a concern. In the case of the Liquid/Power Type and the Powder/Liquid Type, it is practical for the powder first to disseminate and then the liquid to flow. Then, with the Powder/Liquid Type, after both have been disseminated, a suitable amount of water is added. Handling the Liquid/Liquid Type is simple and, even though it is suitable for any arbitrary hard surfaces in any location or quantity, it is suitable in particular for an inclined surface or a location that is difficult to reach by hand. From that standpoint it is also convenient since the stability of hydrogen peroxide and sodium hypochlorite as liquids can be maintained.

When agents A and B react in contact with the hard surface contaminant, decomposition of the contaminant is conducted by means of the oxidative strength of the oxygen being generated. Oxygen generated by both the decomposition of the inorganic peroxide and that of the hypochlorite, tightens the control by acting synergistically on the contaminant. Because hypochlorite possesses particularly strong sterilizing power, it acts as a sterilizing agent and as an exceptional agent in treating mold.

Also, foam generated in large quantities from the reaction removes the contaminant through physical power.

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In this way, it is capable of removal even in locations that are difficult to reach by hand and, even if the work of scrubbing, etc. isn't done, removal is performed. Again by means of foam generation, even in locations where it is difficult for detergent to be carried such as a concave area, the detergent is carried by means of the surging power of the foam enabling cleaning to be conducted efficiently. Also, making it easy to apply the detergent to a hard surface by means of generating foam makes the cleaning of even inclined or vertical surfaces possible by enabling the detergent to remain on the surface for sufficient time required for cleaning.

Furthermore, by allowing the reaction of agent A and agent B to mature enables the sticking power of the contaminant to decrease.

As in the above, the detergent composition of the invention relies upon the decomposition of peroxide and hypochlorite.

- (1) Oxidative power and sterilization power
  - (2) Foam generation accompanied by force on contaminant other than physical, replenishment of detergent and detergent application that is not retained.
  - (3) Heat of reaction
- work synergistically, and a detergency that exceeded what couldn't even be imagined with a conventional detergent.



Also, such things as prevention of propagation of bacteria by means of using a pH buffer of silicate salt arrange within agent B, together with a small application of deodorant to prevent generation of odor from formation of a membrane on the surface, enable the continuation of the effect implemented by application of a small amount of deodorant especially on the drainpipe contaminant and in the trap, and demonstrate that odor-extinguishing and odor-preventive effects that, until now, were not able to be seen.

Having multiple-textured surface on the surface that must be cleaned demonstrates the observation that surfaces that are difficult to clean are those that have concavities and eruptions. In this way the important matters of foam-generation and stability of foam come into play. For example, consider the example of a drainpipe with flow through a bathroom for family use. This drainpipe travels nearly straight and then drops off acutely, and has a large amount of accumulation on its interior walls. The path of the flow of water changes in different locations and, in the case of the flow of water, there are areas wherein no water flows within the designated route of the pipe. It is at that point where the detergent is ejected into the pipe, and it may not even come into contact with the pipe at that point, which does not allow for efficient cleaning. This was evidenced in Patent Publication No. 52 (1978) - 152406, similarly in 53-50207, and in 53-50208 a method using an acid agent and an alkaline carbonate, a method of using an oxidizing agent such as an acid agent, an alkaline carbonate, and a hypercarbic soda, respectively but the detergency was not sufficient to provide an adequate cleaning.

To counter this, in the case where agents A and B of this invention are used, having a volume of foam together with strong foaming force, an adequate amount of force is applied to the contaminant adhered throughout the interior of the drainpipe, and comes into contact with the contaminant over a sufficient period of time that allows for the contaminant to be drawn down. Particularly in the case where a small amount of surfactant is included in both agents A and B, foam-generation increases as long as a stable foam is created, thereby increasing the foam generating effects indicated previously.

As was clearly indicated in the explanation above, this invention of a double component type foam-generating detergent composition is effective on nearly all types of hard surfaces, on surfaces that have generated mold, on textured surfaces, vertical surfaces, etc. as well as in locations where the flow of the detergent would be easy, and, additionally, it is especially effective on the concavities and eruptions such as those inside a pipe and other locations where cleaning is desired. Basically, it is suitable as a toilet cleaner, a preventive agent for mold and miscellaneous contaminants, and is particularly effective as a drainpipe cleaner.

Within the composition of the detergent in this invention, and within, again, the agents A and B, are volume-increasing agents such as, nitrates, sodium carbonate, table salt, sodium triphosphate, sodium diphosphate, triphosphate, viro potassium phosphate, coloring agent, fragrance, anti-bacterial agent, chelating agent, alkali agent, and additional adducts. The addition of these adducts is for stability and to prevent loss of virility. For example, chelating agent and activator are suitable for addition to agent A.

The following is a detailed explaining of the invention using a working example

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**Working Example 1**

The composition of items in this invention shown in table 1 and in the comparative working examples are made as test materials and an evaluation of made of their odor-preventive effects and detergency on kitchen contaminants by means of the evaluative methods below. Those results are shown in Table 1.

**(1) Detergency**

A contaminant model was made 200 g of powdered sop, 100 g of tempura oil, 50 g of ground fish, 20 g of gelatin, and 40 g miscellaneous contaminants (soil, minerals, etc.) are pumped 2 cm thick onto the surface of a vinyl hose to the point where not even a stream of water could penetrate the mass.

The detergency was evaluated by attaching the hose previously mentioned to the drain water orifice in the family-use kitchen.

Items of this invention and of the comparative example 1 and 50 g each of agents A and B were introduced into the drain orifice at the same time and water began to flow after 1 hour.

In comparative examples 2 and 3, 100 g flowed, but hesitated through the drain opening.

In comparative examples 4 and 5, 100 g was introduced around the drain opening and after more than 1 hour 100g of water was used to instigate flow.

◎: 60 ~ 100 % elimination

○: 30 ~ 60 % elimination

△: 10 ~ 30 % elimination

X: Less than 10 % (almost nothing eliminated)

**(2) Deodorant Effect**

Deodorant effects were evaluated immediately after the previously indicated detergency test and after 3 days of use.

○: No evidence of bad odor

△: Slight evidence of bad odor

X: Extremely strong odor

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Table No. 1

Component	Items of This Invention							Comparative Examples				
	1	2	3	4	5	6	7	1	2	3	4	5
Agent A:												
Hydrogen Peroxide	10	5	2	5	10	5	5	5		5		
Softanol 120 <sup>(1)</sup>			2			2	2					
NES - D <sup>(2)</sup>				2				2		2		
Chloride Benzalkonium					2							
Fragrance			0.5	0.5	0.5	0.5	0.5	0.5		0.5		
Water	90	95	95.5	92.5	87.5	92.5	92.5	92.5		92.5		
Agent B:												
Sodium hypochlorite	12	6	6	2	12	6	6	6	6			
NES-D			2			2			2			
Sodium metasilicate	3	2	2	1	3	1	1					
Caustic soda						1		1	1			
Hypercarbic soda											90	50
Sulfamine acid												30
Sodium carbonate											7.5	15
Caustic soda											2	
LAS - Na <sup>(3)</sup>												4.5
Fragrance											0.5	0.5
Detergency	○	○	⊙	⊙	⊙	⊙	⊙	⊙	○-△	x	△-x	△-x
Deodorant Effect	Immed. After	○	○	○	○	○	○	○	△	△	△	△
Deodorant Effect	3 days After	△	△-○	○	○	○	○	△-x	x	x	x	x

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- (1) Softanol 90; (2) Alcohol EO adduct  
(EOP = 10)  
(2) NES-D: Polyoxyethylene nonyl phenyl ether  
(EOP = 10)  
(3) LAS - Na: Sodium alkylbenzene sulfonate

**Working Example 2**

Same as Working Example 1 with the exception of use of model bathroom contaminant, evaluating detergency and deodorizing power, results of which are shown in Table 2.

**Bathroom Contaminant**

Added and combined 200 g of powdered soap, 100 g of fatty acid (oleic acid/stearic acid = 60/40), 50 g of gelatin, and 50 g of unspecified contaminant (simple loam and calcareous dirt) to 20 kg of waste water at 50° DH, and hose was manufactured in same way as that for the kitchen.

Table 2

<u>Component</u>	<u>Items in this Invention</u>	<u>Comparative Example</u>
Detergency	<i>[see original]</i>	
Deodorizing Effect (Immediately after) (3 days after)		

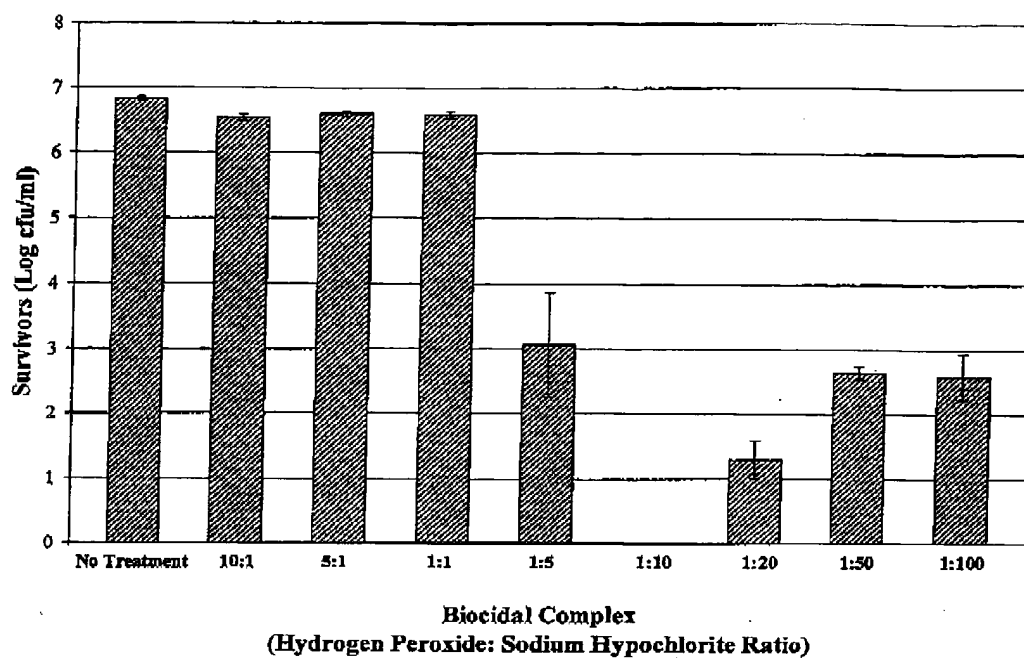
**Working Example 3**

An evaluation of deodorizing effect was conducted by adding 50 g each of agents A and B each simultaneously to a sample extracted from the drainpipe trap to the item of this invention and the comparative example 1, using 3 liters from a 5 liter bathroom bowl then addition 100 g to comparative examples 2 ~ 5. Those results are shown in Table 3.

Table 3

<u>Component</u>	<u>Items in this Invention</u>	<u>Comparative Example</u>
Detergency	<i>[see original]</i>	
Deodorizing Effect (Immediately after) (3 days after)		

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**Hydrogen Peroxide: Sodium Hypochlorite Ratio Effect****Legend:**

	HP (ppm)	SH (ppm)
ratio 10:1	40000	4000
ratio 5:1	50000	10000
ratio 1:1	40000	40000
ratio 1:5	10000	50000
ratio 1:10	4000	40000
ratio 1:20	2000	40000
ratio 1:50	800	40000
ratio 1:100	400	40000